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Decay of rabi oscillations induced by magnetic dipole interactions in dilute paramagnetic solids

Baibekov E.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

Decay of Rabi oscillations of equivalent spins diluted in diamagnetic solid matrix and coupled by magnetic dipole interactions is theoretically studied. It is shown that these interactions result in random shifts of spin transient nutation frequencies and thus lead to the decay of the transient signal. Averaging over random spatial distribution of spins within the solid and over their spectral positions within magnetic resonance line, we obtain analytical expressions for the decay of Rabi oscillations. The rate of the decay in the case when the half-width of magnetic resonance line exceeds Rabi frequency is found to depend on the intensity of resonant microwave field and on the spin concentration. The results are compared with the literature data for E′ 1 centers in glassy silica and [AlO 4] 0 centers in quartz. © 2011 Pleiades Publishing, Ltd.

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